

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant: Olivier J.A. Schueller et al.  
Serial No.: 10/824,331  
Confirmation No.: 5408  
Filed: April 14, 2004  
For: OPTICAL MODULATOR/DETECTOR BASED ON  
RECONFIGURABLE DIFFRACTION GRATING  
Examiner: C. A. Simone  
Art Unit: 1794

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**DECLARATION UNDER 37 C.F.R. §1.132**

I, Dr. David C. Duffy, declare to my own knowledge that:

1. I am the Senior Director of Platform Research at Quanterix Corporation. I have authored or co-authored over 20 publications in academic peer-reviewed journals. I received Bachelor of Arts (1992) and Master of Arts (1995) degrees in the Natural Sciences from the University of Cambridge. I received a Ph.D. in Chemistry from the University of Cambridge in 1996. Following my graduate work, I was the Sir Alan Wilson Research Fellow at Emmanuel College in the University of Cambridge. I also performed one year of post-doctoral research at Harvard University. I have worked as a scientist at Unilever and Gamera Bioscience, and was the Director of Pharmacomer Technology at Surface Logix, Inc. for over 7 years. I am a chemist with research interests in the areas of microfluidics, microfabrication, surface chemistry, and single-molecule diagnostics. I am a member of a Special Emphasis peer review panel for the National Cancer Institute (NCI).
  
2. I am an inventor in the above-reference application. As an inventor, I stand to derive a portion of any financial benefit from licensing this patent application and/or patent issuing therefrom.

3. I have read and am familiar with the above-referenced application (the “Application”). In addition, I have read and am familiar with the outstanding Office Action, dated April 1, 2010, in this case, the claims in the above-referenced application in their latest form, and the art cited by the Examiner in the Office Action: U.S. Patent No. 5,443,890 to Ohman (“Ohman”) and U.S. Patent No. 5,885,470 to Parce, *et al.* (“Parce”).

4. Based on my professional education and experience, and my understanding of the level of ordinary skill in the fields of fluidics and device fabrication in general, it is my understanding that the microfluidic systems described in Parce do not include a polymeric component, as recited in claim 1, having a surface defining a plurality of protrusions and a plurality of intervening indentations, portions of the surface defining the indentations being of material essentially identical to that of portions of the surface defining the protrusions, with the protrusions bonded to a surface of a second component in the absence of auxiliary adhesive thereby defining a liquid-impermeable seal therebetween, wherein the liquid-impermeable seal comprises siloxane bonds and wherein the plurality of intervening indentations are not bonded to the surface of the second component. Rather, the microfluidic channels in Parce are formed by methods that would not necessarily inherently produce siloxane bonds between Parce’s mated materials.

5. Contrary to the assertion by the Patent Office in the Office Action dated April 1, 2010, Parce does not disclose the formation of a liquid impermeable seal comprising siloxane bonds in Column 9, lines 15-27. Rather, this section of Parce describes methods for modifying and derivitizing surfaces of polymeric materials to “present an appropriate zeta potential at the fluid interface” (see, e.g., Col. 9, lines 16-19). Parce describes systems and methods for producing a surface with an “appropriate zeta potential” within the context of utilizing controlled electroosmotic flow (as opposed to pumps, valves, or the application of external pressure) to selectively direct fluids among and through interconnected channels (see, e.g., Col. 6, line 36 to Col. 7, line 2). Thus, it appears clear that Parce describes techniques for modifying and derivatizing interior surfaces of channels through which fluid will flow, rather than surfaces that are joined to define such channels, and one of ordinary skill in the art would have had no reason

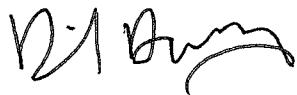
to apply the systems and methods described from Col. 6, line 36 to Col. 9, line 41 to methods for forming seals between polymeric materials.

6. Furthermore, even if one of ordinary skill in the art would have had reason to modify the teachings of Parce to produce the invention as claimed (which I do not believe to be the case), based on the teachings of Parce, one of ordinary skill in the art would have had no reasonable expectation of success. Specifically, one of ordinary skill in the art would have expected that plasma treating the surface of polydimethylsiloxane (PDMS) as described by Parce would have produced hydroxyl groups (see, e.g., Col. 9, lines 23-27 of Parce, where modification of the PDMS surface using plasma irradiation is described to oxidize the methyl groups present in the polymer, liberating carbon atoms and leaving hydroxyl groups), rather than the siloxane bonds between bonded materials as required by all claims pending in the Application. Therefore, one of ordinary skill in the art would have had no reason to modify the teachings of Parce to produce the invention as claimed, and if modified as such, would have had no reasonable expectation of success in using plasma irradiation to produce siloxane groups.

7. In further support of the conclusion expressed in paragraphs 4-6, above, no disclosure can be found in Parce for the formation of a liquid impermeable seal comprising siloxane bonds. Parce describes the formation of microfluidic channels by mating a first planar substrate including a plurality of grooves or wells with a second planar substrate in Column 6, lines 1-35. Parce notes that such mating can be performed through the use of adhesives, sonic welding, or the application of pressure under elevated temperatures (see, e.g., Col. 6, lines 1-21). None of these methods anticipates or makes obvious the claimed invention. Claim 52 of the Application explicitly notes that the bond is formed “in the absence of auxiliary adhesive.” In addition, neither sonic welding nor the application of pressure under elevated temperatures would necessarily inherently produce siloxane bonds when used in conjunction with polymeric components such as PDMS. Sonic welding would effect mating by causing melting of the polymeric material due to absorption of vibration energy. In addition, the application of pressure under elevated temperatures would effect mating by melting the polymeric material. Neither method would modify the surface of the polymeric material (e.g., PDMS) to produce siloxane

bonds. Thus, none of the methods described in Parce would necessarily inherently produce a liquid impermeable seal comprising siloxane bonds, as required by claim 52.

8. I hereby declare that all statement made herein are of my own knowledge and are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of this documents and any patent which may issue from the above-identified patent application.



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